REMARKS/ARGUMENTS

Favorable reconsideration of this application, in light of the present amendment and following discussion, is respectfully requested.

Claims 1-21 were canceled previously. Claims 34-42 are withdrawn. Claims 22-33 are pending.

Claim 22 is amended. Support for the amendment to Claim 22 can be found in the specification at least on page 7, lines 9-13. No new matter is added.

Rejection of Claims 22, 23, 26, 28 and 33 under 35 U.S.C. § 102 (b) as being anticipated by U.S. Patent No. 3,608,166 to Gruget

The Office states that Gruget discloses a method of making a mat including glass fiber; see col. 1, lines 56-58 and col. 3, lines 13-15. The Office goes on to state the method includes deposition or projection of threads including glass fibers onto a traveling belt to form a lap driven by the belt, as claimed; see col. 2, lines 42-49.

Applicants note at column 2, lines 42-49 Gruget teaches:

> "The connecting fibers may assume the form of a regular mat without cohesion distributed in an air or hydraulic path, for example, by means of a machine called a "Curlator" comprising a fan sucking the fibers issuing from a wool-comber and depositing them in the form of a thin mat. This mat of connecting fibers may be put in place, by action of conveyor belts above, below, or at the interior of the mat of mineral fibers."

Applicants respectfully submit that column 2, lines 42-49 of Gruget teaches deposition solely as a step in forming a mat of "connecting fibers". Gruget further teaches the connecting fibers are made of organic fibers (column 1, lines 70 – 72). In contrast, Applicants' invention includes the step of "deposition or projection of threads including glass fibers onto a traveling belt to form a lap" as recited in Claim 22. Applicants respectfully submit that nowhere does Gruget teach the step of "deposition or projection of threads including glass fibers onto a traveling belt to form a lap" as recited in Claim 22.

The Office further states a step of needling the lap is disclosed; see col. 3, lines 28-29. The Office indicates the needles are passed through the lap as claimed, being displaced vertically at a speed at which they penetrate the web, so as to entangle the fibers.

Applicants respectfully submit that Gruget teaches away from the needling step Applicants' invention. In particular, Gruget teaches:

> "[T]his process [needling] can be utilized only in the case where the fibers are pliable and have high elongation or stretch characteristics. Practically, it is employed only for mats or cushions of jute or similar fibers, or of organic synthetic fibers. When the attempt has been made to apply this process to a pad or mat of mineral fibers, such as *glass fibers, the obtained results have been bad.*" (col. 1, lines 40 – 46, emphasis added)

Gruget's very particular solution to this problem is to combine mineral fibers, such as glass fibers, with "connecting fibers" having "stretch and pliability characteristics greater than those of the fibers of the mat, and in actuating the needles, which, by their movement, entrain these connecting fibers through the mat." (column 1, lines 63 - 67.) In contrast, Applicants' invention advantageously requires no such "connecting fibers."

As noted in Applicants' disclosure, in the very particular needling step of Applicants' invention the needles are displaced in a direction parallel to the direction of displacement of the mat, so that needles accompany the mat when they penetrate the mat. Accordingly Claim 22 has been amended to clarify that the needling step includes needles "displaced in a direction parallel to the lap direction at substantially a same speed as the lap speed when they pass through the lap". Applicants submit that this is a step nowhere taught or suggested by Gruget.

The Office states that the needles are bearded (see barbs 4).

Applicants note that the only stated function of the barbed needles taught by Gruget is "entraining the connecting fibers by the needle barbs" (see for example, column 3, lines 54-55), a step neither taught nor claimed by the Applicant.

As noted in Applicants' disclosure, Applicants' invention advantageously makes it possible to produce a mat without any needle holes visible to the naked eye, thereby avoiding surface defects in the final product – an advantage neither taught nor suggested by Gruget.

In light of the above, Applicants submit that amended Claim 22 is neither anticipated nor obvious in view of Gruget, and that amended Claim 22 is in condition for allowance. Claims 23, 26, 28 and 33 depend directly from amended Claim 22, and are also in condition for allowance for at least those reasons.

Regarding claim 26, the Office concludes the glass fibers are formed by attenuation, which forms continuous threads as in claim 26 (col. 3, lines 13-16).

Regarding Claim 26, Applicants respectfully submit that the process described in the cited section of Gruget -- one in which "glass fibers derived from filaments issuing by centrifugal force from orifices provided in the band of a rotating body, these filaments being transformed into fibers by attenuation" -- produces discontinuous fibers, not continuous fibers. The process described in the cited section of Gruget is a rotary wool forming process in which "molten glass is delivered to a rotating cylinder the face of which is perforated with a large number of holes. Glass streams, projected laterally from the holes by centrifugal force, are then attenuated into *discontinuous fibers* by a high velocity gas stream" (emphasis added, The Handbook of Glass Manufacture, Fay V. Tooley, editor, Ashlee Publishing, New York, New York, 1984, Vol. II, page 725.)

In contrast, Applicants' invention advantageously may employ continuous threads comprised of continuous fibers. Continuous fibers are formed by drawing molten glass through a stationary, multi-hole surface called a bushing. Mechanical tension generated by high speed winders draws the individual fibers into very, very, very long, thin filaments. As recited in Claim 26, Applicants' invention may advantageously include a step "wherein the threads are continuous threads including the glass fibers", a step neither taught nor suggested by Gruget. As noted in Applicants' disclosure, employing continuous threads advantageously provides a composite product simultaneously having 5 – 12% greater rigidity, greater homogeneity of reinforcement, and a composite product where the edge of the molded pieces are much cleaner and smoother and better formed, than when cut threads were used -- advantages neither taught nor suggested by Gruget.

In light of the above, Applicant submits that Claim 26 is in condition for allowance in its own right.

As to Claim 28, the Office indicates Gruget discloses that the barbs may be directed toward the support (col. 2, lines 14-16). The Office concludes the needles

clearly are fastened to a support, as they inherently require a support in order to function as disclosed and as shown in Figs. 1-2.

Regarding Claim 28, Applicants note that Gruget teaches "needles with inversely directed barbs" only in the context of a needling a mat having connecting fibers, and then only where those connecting fibers are disposed at very specific locations in the mat, i.e. the lower part of the mat or in the middle of the mat (column 2, lines 13 – 21). Applicants therefore submit that Claim 28 is in condition for allowance in its own right.

The Office states no binder is used, as in claim 33.

Regarding Claim 33, Applicants note that the very particular method of Applicants' invention recited in Claim 33 produces a product having advantages neither taught nor suggested by Gruget. As noted in Applicants' disclosure, Applicants' invention as recited in Claim 33, "wherein the mat does not contain any binder", advantageously makes it possible to make composite materials which are particularly translucent, an advantage neither taught nor suggested by Gruget. Applicants therefore submit that Claim 33 is in condition for allowance in its own right.

Rejection of Claims 22 – 25, 27 – 31, and 33 under 35 U.S.C. § 103 (a) as being unpatentable over U.S. Patent No. 5,458,960 to Nieminen et al. in view of U.S. Patent No. 3,608,166 to Gruget

The Office states that Nieminen et al. disclose a method of making a mat including glass fiber, comprising deposition or projection of threads including glass fibers onto a traveling belt to form a lap driven by the belt, as claimed; see col. 8, lines 46-52. Also see col. 2, lines 25 and 38, and col. 3, lines 4 – 14 disclosing the use of glass fiber which forms "thread" to the extent claimed.

The Office further states a step of needling the lap is disclosed; see col. 3, lines 24 – 43 and col. 9, lines 19 – 32. The Office goes on to say the needles are passed through the lap as claimed, being displaced vertically at a speed at which they penetrate the web, so as to entangle the fibers.

The Office indicates Nieminen et al. disclose that the needling density (and thus the "stroke density") is in the range of 2 to 20 punches per square centimeter (col. 3, lines 38 – 42), which falls within the range recited in claim 22. The Office

concedes the needles are not disclosed as being bearded, however the Office concludes that bearded needles are conventional in the art. The Office states Gruget discloses the use of bearded needles for needling a web of glass fibers; see col. 1, line 58; col. 2, lines 3 – 16; and barbs 4 on needle 3, which forms a "bearded" structure. The Office goes on to state that barbed or bearded needles are advantageous in that they facilitate movement of and entanglement of fibers by pulling fibers with the barbs. The Office concludes it would have been obvious to one having ordinary skill in the art at the time the invention was made to use bearded needles in the method of Nieminen et al. in order to facilitate movement of and entanglement of fibers, as shown by Gruget.

Applicants submit that Nieminen et al. teach a method of making a different product for a different application. Nieminen et al. teach a method of making a construction material with superior strength and insulation properties. (column 1, line 50 and column 5, lines 45-46) In contrast, as noted in Applicants' disclosure, Applicants' invention provides a method of making a mat which advantageously can be used for the reinforcement of composite materials. Applicants' invention advantageously makes it possible to produce a mat which avoids surface defects in a composite material produced there from – an advantage neither taught nor suggested by Nieminen et al.

The product of Nieminen et al. is formed predominantly of short, discontinuous mineral fibers, such as glass wool (column 2, lines 22-26). The mineral fibers are mixed with "blend fibers", which are chopped glass fibers or fibers of a synthetic polymeric material. (column 3, lines 4-8 and line17-18) Applicants note that Nieminen et al. teach "needling is effected so that the blend fibers are entrained by the needles and shifted towards the surface opposite to that from where the needles punch the mat." (Column 3, lines 33-36) As a result, and as is shown in the figures of Niemenen et al., Applicants submit that the needling step of Nieminen et al. produces one or more surfaces replete with spikes that might prick the hands. In contrast, as described in Applicants' disclosure, the method of Applicants' invention advantageously produces a mat which does not prick the hands.

As noted above, in the very particular needling step of Applicants' invention, the needles are displaced in a direction parallel to the direction of displacement of the mat, so that needles accompany the mat when they penetrate the mat. Accordingly

Claim 22 has been amended to clarify that the needling step includes needles "displaced in a direction parallel to the lap direction at substantially a same speed as the lap speed." Applicants submit that this is a step nowhere taught or suggested by Nieminen or Gruget, either alone or in combination.

In light of the above, Applicant submits that Claim 22 is in condition for allowance. Claims 23 – 25, 27 – 31, and 33 depend from Claim 22, and are in condition for allowance for at least those reasons.

The Office concedes that Nieminen does not disclose the speed of advance of the lap, and therefore does not disclose a speed within the ranges of 2 – 35 m/min, 8m/min or greater, or 20 m/min or less, as in claims 29-31. The Office concludes it is within the ordinary skill in the art, however, to determine the optimal speed of advance of the web through routine experimentation, depending upon the materials used and the desired end properties of the product. It would have been obvious to one having ordinary skill in the art at the time the invention was made to advance the lap in the method of Nieminen at a speed within the ranges recited in claims 29-31, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable range involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding Claims 29 – 31, Applicants note that Claims 29 - 31 depend from Claim 22 and are in condition for allowance for at least those reasons. Applicants also submit that nowhere does Nieminen et al. state that a mat or lap is in motion during the needling step. Applicants therefore submit that one cannot optimize a property that is not taught, and that Claims 29 – 31 are in condition for allowance in their own right.

The Office states Nieminen discloses that the mat does not contain any binder (col. 2, lines 46-48 and col. 7, lines 63-64), as in claim 33.

Regarding Claim 33, Applicants note that Claim 33 depends from Claim 22 and is in condition for allowance for at least those reasons. Applicants further note that the very particular method of Applicants' invention recited in Claim 33 produces a product having advantages neither taught nor suggested by Gruget or Nieminen et al. As noted above, Applicants' invention as recited in Claim 33, "wherein the mat does not contain any binder", advantageously makes it possible to make composite materials which are particularly translucent, an advantage neither taught nor

suggested by Nieminen et al. or Gruget. Applicants therefore submit that Claim 33 is in condition for allowance in its own right.

Rejection of Claims 24, 25, and 29 – 31 under 35 U.S.C. § 103 (a) as being unpatentable over U.S. Patent No. 3,608,166 to Gruget

The Office indicates that Gruget discloses a method of making a mat including glass fiber as claimed. The stroke density is disclosed as 12 – 15 piercings (strokes) per cm^2 ; see col. 3, lines 29 – 31. The Office concedes that the density is not disclosed as at most 10 piercings (strokes) per cm^2 as in claim 24. Also, the Office concedes that the density is not disclosed as being at most 2 strokes per cm^2 as in claim 25. The Office concludes that it is within the ordinary skill in the art, however, to determine the optimal number of strokes per cm^2 through routine experimentation, depending upon the desired end properties of the product. The Office concludes it would have been obvious to one having ordinary skill in the art at the time the invention was made to needle the lap in the method of Gruget with a stroke density of at most 10 stroke per cm2, or at most 2 strokes per cm2, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable range involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding Claims 24 and 25, Applicants note that Claims 24 and 25 depend from Claim 22 and are in condition for allowance for at least those reasons. As noted above, Applicants submit that Gruget teaches away from needling of glass fibers unless connecting fibers are used. Applicants submit that Gruget teaches 12 – 15 piercings (strokes) per cm^2 only in the very particular circumstance in which a felt of glass fibers is covered by a mat of nylon "connecting fibers." (column 3, lines 20-32) Applicants therefore submit that Claims 24 and 25 are in condition for allowance in their own right.

The Office also concedes that Gruget does not disclose the speed of advance of the lap, and therefore does not disclose a speed within the range of 2 – 35 m/min, 8 m/min or greater, or 20 m/min or less, as in claims 29 – 31. The Office concludes, it is within the ordinary skill in the art, however, to determine the optimal speed of advance of the web through routine experimentation, depending upon the material used and the desired end properties of the product. The Office concludes it would

have been obvious to one having ordinary skill in the art at the time the invention was made to advance the lap in the method of Gruget at a speed within the ranges recited in claims 29 – 31, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding Claims 29 – 31, as noted above, Applicants submit that nowhere does Gruget teach that a mat or lap is in motion during the needling process. Applicants note that Gruget teaches a conveyor belt only in the context of putting a mat of connecting fibers above, below or at the interior of a mat of mineral fibers (column 2, lines 46 – 68). Indeed, in the sole example Gruget teaches "[t]his assembly is placed in a 'Bowater' needling device" (column 3, lines 28 – 29), which strongly suggests that the assembly is stationary during needling. One cannot optimize a property that is not taught. Applicants therefore submit that Claims 29 – 31 are in condition for allowance in their own right.

Rejection of Claim 32 under 35 U.S.C. § 103 (a) as being unpatentable over U.S. Patent No. 3,608,166 to Gruget in view of U.S. Patent No. 5,732,453 to Dilo et al.

The Office states that Gruget discloses a method as claimed, however the Office concedes the needles are not disclosed as describing an elliptical movement, as in claim 32. The Office further stated that Dilo discloses a method and apparatus for needling in which the needles are moved in the machine direction as well as the vertical direction, with the needles moving in the machine direction while extending through the substrate such that they travel in an elliptical path (col. 1, lines 54 – 67 and col. 7, lines 38 – 59. The Office concludes such a needle movement is well known in the art.

The Office goes on to state that Dilo teaches that this needle movement permits increased speeds (i.e. a high feed of the web per needle bar stroke) due to the movement of the needles in the machine direction (col. 1, lines 35 – 51) during penetration of the web. The Office concludes it would have been obvious to one having ordinary skill in the art at the time the invention was made to use a needle loom in the method of Gruget which provides needle movement in both the vertical and horizontal directions such that an elliptical needle path is formed, in order to permit higher processing speed without damaging the web, as taught by Dilo.

Regarding Claim 32, as noted above, Applicants submit that Gruget teaches away from needling a mat including glass fibers, other than a method which requires the use of very particular "connecting fibers". Applicants note that glass fibers differ fundamentally from other fibers in almost all respects except name. Where the ordinary fiber is absorbent, a glass fiber is perfectly non-absorbent. Further, it is uniformly cylindrical, whereas most other fibers, both natural and synthetic, are of irregular form in cross section. While a fiber is commonly considered as soft and pliable, a fibrous glass fiber is hard and thoroughly resilient. Instead of a scaly or hairy surface of a clinging nature, the surface of a glass fiber is smooth. On a greatly enlarged scale, a mass of glass fibers contrasts with a group of ordinary fibers as does a tangle of steel wire with a collection of short lengths of limp cotton clothesline. These differing characteristics make the glass fibers peculiarly valuable, but also make them most difficult to manipulate.

Applicants further submit that Gruget fails to teach needling a lap of threads including glass fibers that is in motion during the needling process, and that Dilo fails to teach any particular fiber, let alone glass fibers.

In light of the above, Applicants submit that one of ordinary skill in the art would not look to combine the teachings of Gruget and Dilo, and that Claim 32 is in condition for allowance in its own right.

Conclusion

As noted in Applicants' disclosure, the method of Applicants' invention provides a mat suitable for reinforcing a composite material and having a number of unexpected advantages, advantages which are neither taught nor suggested by the cited references. These advantages include:

an absence of spikes that prick the hands during handling

sufficient cohesion to be handled and yet able to be deformed by hand, and retain that shape in a mold

high permeability

ability to make finished products having cleaner, smoother and better formed edges

ability to make finished products that are particularly translucent.

Moreover by virtue of Applicants' invention, these results can be achieved at high production speeds, while miminizing broken filaments and a corresponding drop in mechanical properties.

In light of the above discussion and in view of the present amendment, the present application is believed to be in condition for allowance. An early and favorable action to that effect is respectfully requested. If any fees are due in connection with the filing of this notice, including extension of time fees, please charge such necessary fees to Deposit Account No. 50-0568.

Respectfully submitted,

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